West Spring Secondary School
PRELIMINARY EXAMINATION 2018

BIOLOGY

6093/01

SECONDARY 4 Express

Name _____ ( ) **Date** 03 Sep 2018

Class _____ **Duration** 1 hour

Additional Materials: 1 OTAS

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.
Do not use staples, paper-clips, highlighters, glue or correction fluid.
Write your name and index number on the Answer Sheet in the spaces provided.

There are **forty** questions on this paper. Answer **all** questions.
For each question there are four possible answers **A, B, C** and **D**.
Choose the **one** you consider correct and record your choice in **soft pencil** on the separate answer sheet.

Each correct answer will score one mark. A mark will not be deducted for a wrong answer.
Any rough working should be done in this booklet.
The use of approved scientific calculators is allowed for this paper.

This document consists of **15** printed pages including the cover page.

Setter(s) Ms Zhou Siyang **[Turn over**

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1 Some organisms live at the bottom of the seas where it is very dark. To synthesise glucose, they use energy from chemicals in the very hot water that comes out of volcanoes.

What is a distinguishing feature of these organisms?

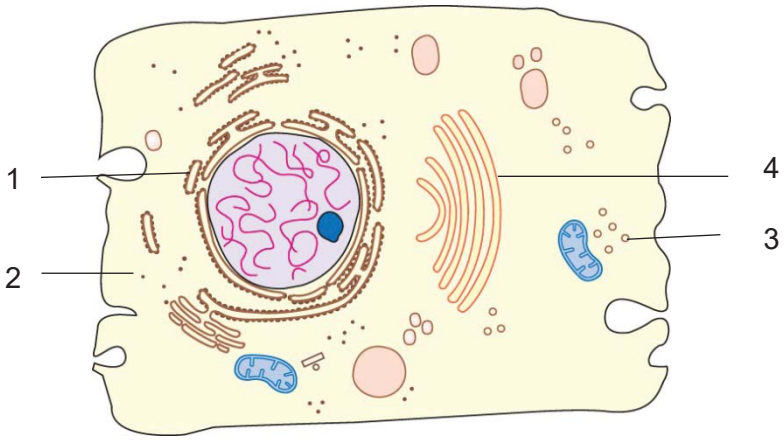
A They do not need oxygen.
B They do not contain chloroplasts
C They do not contain mitochondria.
D Their enzymes are easily denatured by heat.

2 What are the similarities between a neurone and a sieve tube element in phloem?

1 Both lack nuclei.
2 Both are living cells.
3 Both are specialised cells.
4 Both have large surface areas to volume ratio.

A 3 only
B 1 and 4 only
C 2 and 3 only
D 1, 2 and 3 only

3 The diagram shows a typical animal cell with cell components that are involved in the synthesis and secretion of an enzyme.



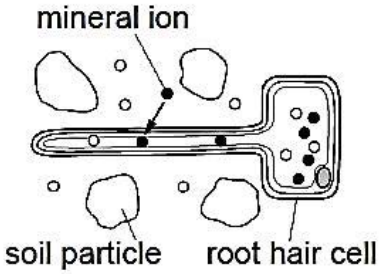
Which of the following identifies correctly the route taken by an amino acid molecule from the point it is synthesised and as it passes through these cell components?

A 2 → 4 → 1 → 3
B 2 → 1 → 4 → 3
C 3 → 2 → 1 → 4
D 3 → 4 → 1 → 2

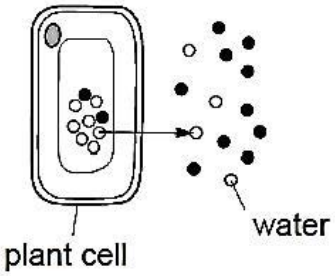
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4 Which diagram illustrates the process of active transport?

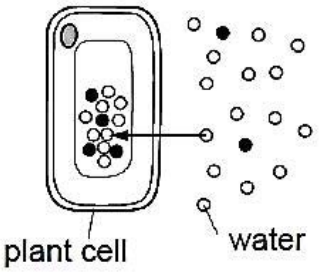
A



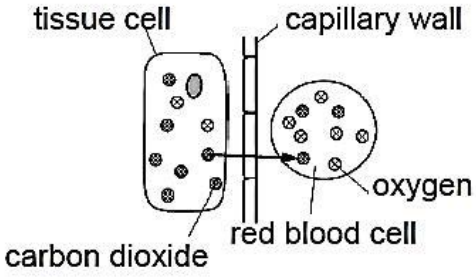
B



C



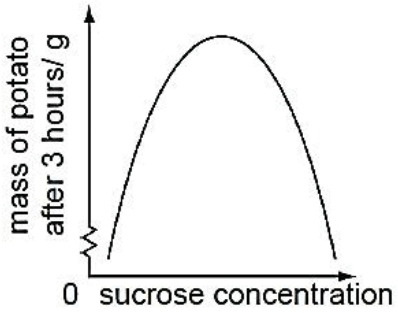
D



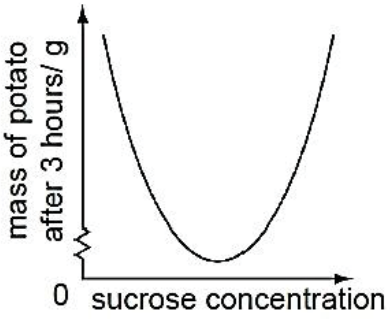
5 Identical pieces of potato are placed in sucrose solutions of different concentrations. After three hours, the mass of each potato piece is measured.

Which graph shows the results of this experiment?

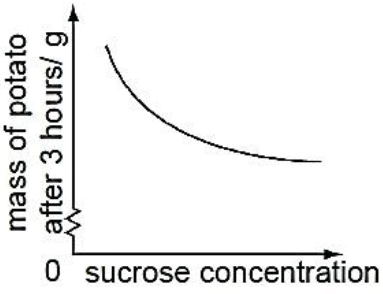
A



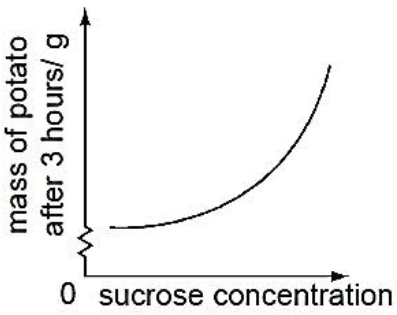
B



C



D



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6 In lactose intolerance, insufficient lactase is produced to digest lactose into molecules small enough to be absorbed by the small intestine. The lactose remains in the lumen of the small intestine and the contents of the small intestine become more hypertonic than usual. Which of the following would be a consequence of this?

A More water will be absorbed by the walls of the small intestine.
B Less lactose will remain in the lumen of the small intestine.
C The intestinal contents become very dry.
D The intestinal contents will contain more water.

7 A student was asked to identify the two food substances in each of three test-tubes.

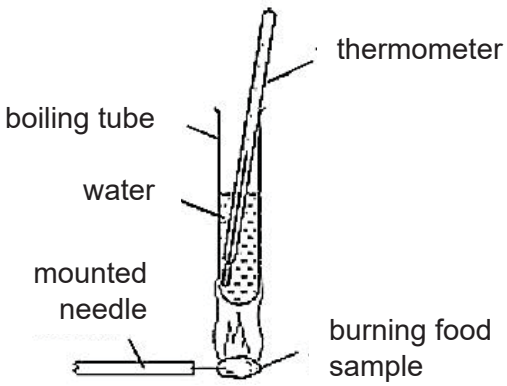
The table shows the results of the student's tests.

test - tube	reagent added to test-tube		
	Biuret solution	Benedict's solution	iodine solution
X	purple	brick-red	brown
Y	blue	blue	blue-black
Z	purple	blue	blue-black

Which conclusion is consistent with the results?

A Egg white and sucrose had been placed in tube X.
B Maltose and starch had been placed in tube Z.
C Maltose and sucrose had been placed in tube X.
D Starch and sucrose had been placed in tube Y.

8 Four equal masses of different foods were burned as shown.



The temperature of the water was measured before and after each food sample was burned. The results are shown in the table. Which food sample is likely to contain the most fats?

	water temperature at the start/°C	water temperature at the end/°C
A	16	37
B	17	95
C	18	87
D	19	22

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9 The following is a list of laboratory steps.

1 add copper(II) sulfate drop by drop
2 shake well to mix
3 place in a boiling water-bath
4 add Benedict's solution
5 add sodium hydroxide solution

Arrange the steps in the order which they need to be carried out to show the presence of a protein.

A 4 → 1 → 2 → 3
B 4 → 2 → 3
C 5 → 2 → 1 → 3
D 5 → 2 → 1

10 A scientist investigated four species of insects. As all the insects look physically familiar, he investigated the digestive enzymes found in their guts.

From the data that he gathered, which insect feeds **only** on human blood?

insect	enzyme(s) present in insect guts			
	amylase	protease	sucrase	lipase
A	-	-	-	+
B	+	-	+	-
C	-	+	-	+
D	+	+	+	-

key: + present; - absent

11 Cubes of hard-boiled egg white are placed in test-tubes containing 5 cm^3 of water. Other substances are added to each tube as shown in the chart. The tubes were left for eight hours and then tested for amino acids.

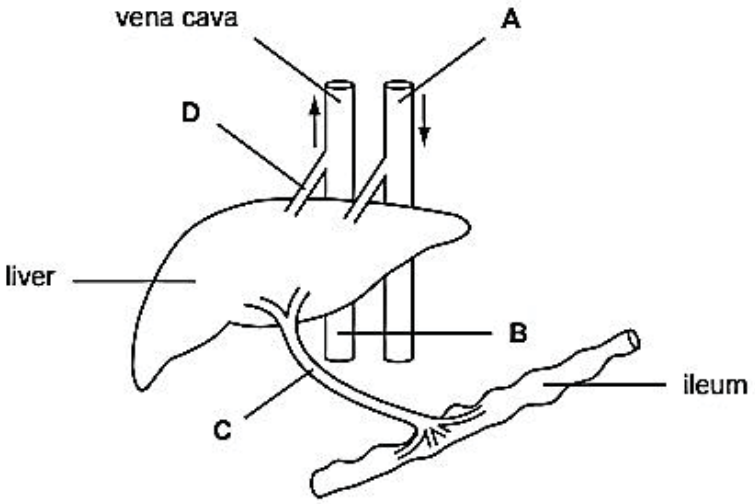
tube	solution added	results for amino acids
1	pepsin	absent
2	pepsin + alkali	absent
3	none	absent
4	pepsin + acid	large amounts
5	boiled pepsin + acid	traces
6	acid	traces
7	alkali	absent

Which tubes show that pepsin is an enzyme?

A 1 and 6
B 2 and 7
C 4 and 5
D 5 and 6

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12 The diagram shows the liver and its associated blood vessels.

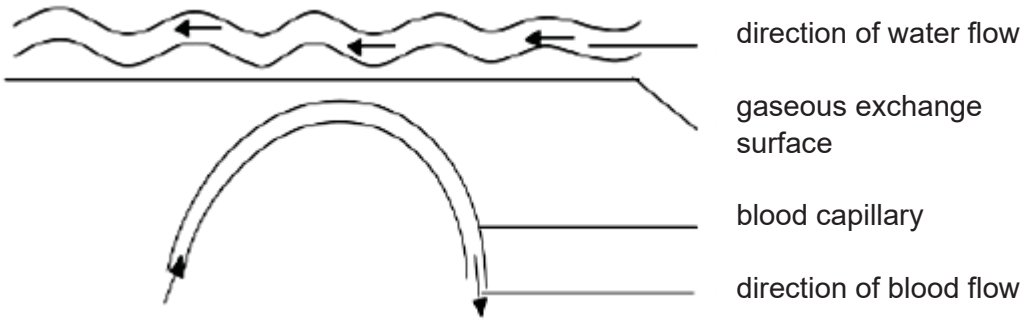


If a person is fasting, which blood vessel would have the highest concentration of glucose after 24 hours?

13 Which row shows the most likely number of chloroplasts in three types of cell in a leaf?

	vascular bundle cell	epidermal cell	mesophyll cell
A	15	8	8
B	8	15	8
C	0	8	15
D	0	0	15

14 The diagram represents the gaseous exchange on the surface of a fish.

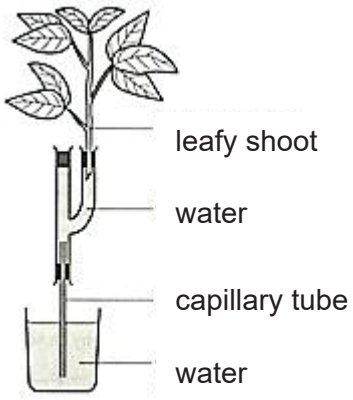


Which conditions would result in the maximum rate of diffusion of oxygen across the gaseous exchange surface?

	amount of dissolved oxygen in water	amount of dissolved oxygen in blood plasma	rate of blood flow
A	large	small	fast
B	large	small	slow
C	small	large	fast
D	small	large	slow

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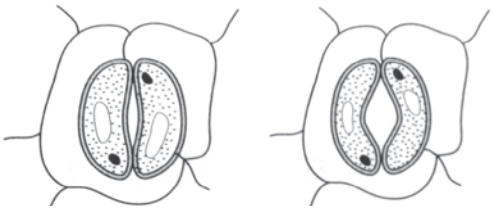
15 The diagram illustrates a simple potometer which measures water uptake in plants.



Which combination of conditions would result in the fastest uptake of water?

A bright light and humid air
B bright light and high temperature
C high humidity and high temperature
D moving air and low temperature

16 The diagram below shows the condition of a stoma at different times of the day.



X Y

Which of the following shows the most probable times at which the stoma is being observed?

	X	Y
A	1.50 pm	9.30 am
B	2.00 pm	7.30 pm
C	10.00 pm	11.00 am
D	11.30 pm	3.15 am

17 An experiment was conducted on a young plant, using an aphid stylet (mouth part) to measure the rate of translocation. The same plant was then placed in a bell jar together with a chemical which absorbs oxygen. It was observed that the rate of translocation decreased and eventually stopped.

Which of the following best explains the above observation?

A Companion cells no longer produced sufficient energy.
B Mitochondria in the xylem vessels ceased to function.
C Photosynthesis could not occur in the plant placed in the bell jar.
D Translocation occurred only by diffusion.

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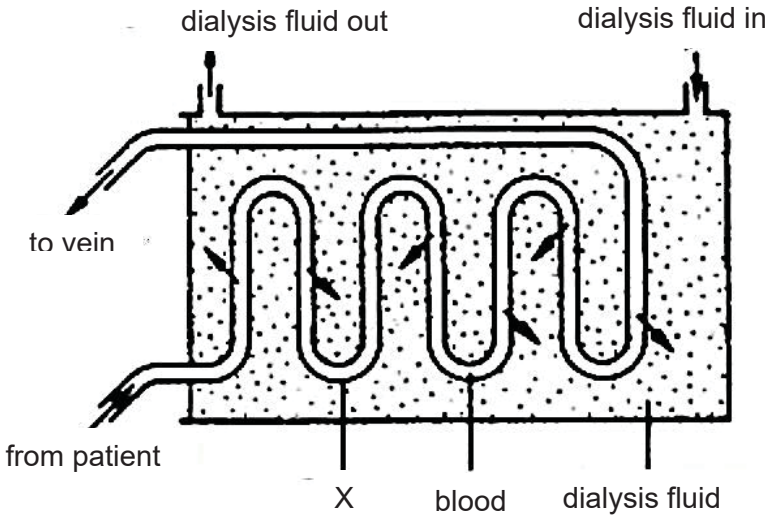
18 The diagram shows someone blowing up a balloon.



How do the proportions of gases in the air inside the balloon compare with the air outside the balloon?

	oxygen	carbon dioxide	water vapour
A	more	less	more
B	more	less	less
C	less	more	more
D	less	more	less

19 The diagram shows a dialysis machine.

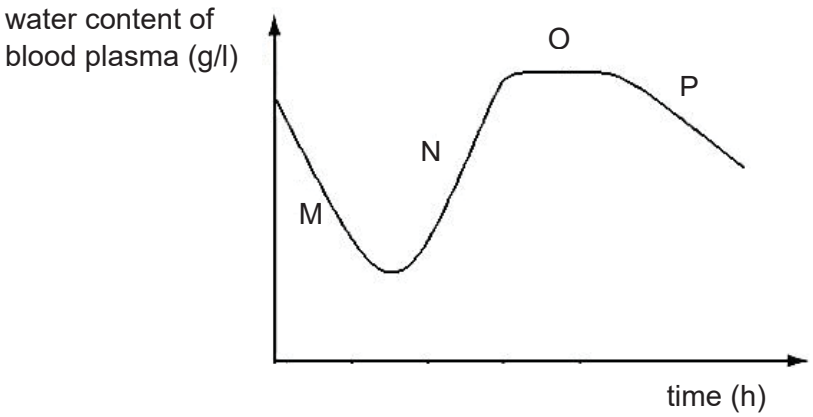


Which process(es) does not happen along X?

A active transport
B diffusion
C osmosis
D osmosis and diffusion

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20 The graph shows the effect of antidiuretic hormone (ADH) on the regulation of water content in blood plasma.



Which part(s) of the graph reflect(s) the effect of increased ADH secretion?

A M only
B N only
C M and P
D N and O

21 Which of the following statements about a voluntary action is true?

A It always involves the contraction of muscles.
B It always involves the spinal cord.
C It is always initiated by a sense organ.
D It is always initiated in the brain.

22 In an accident, a patient's spinal cord was severed at the neck region.

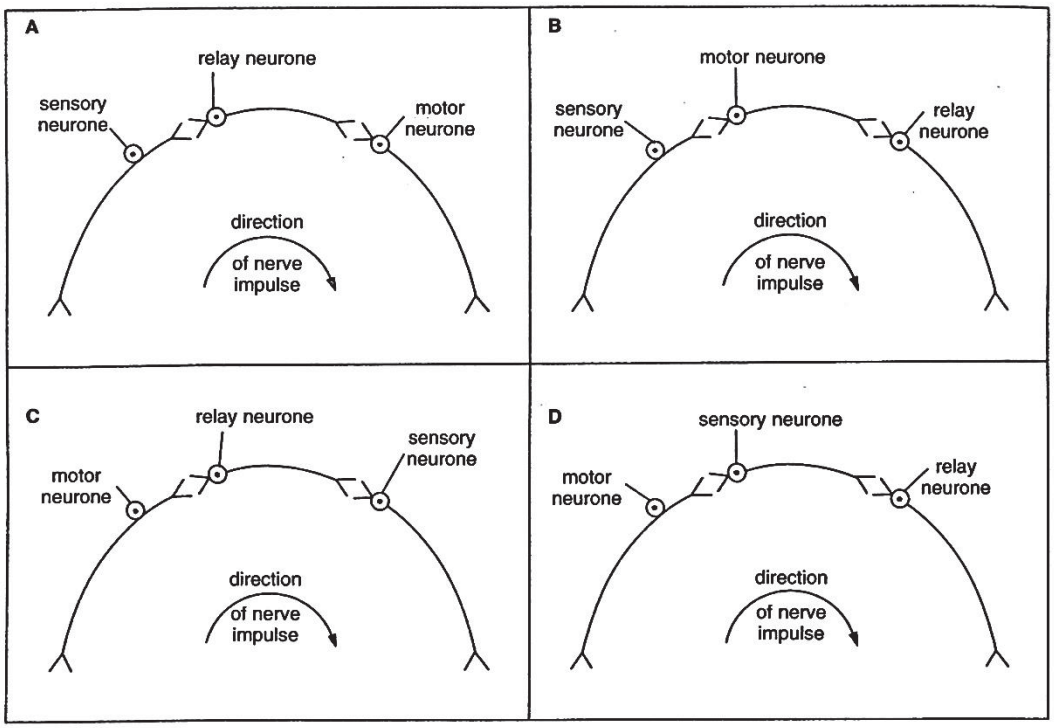
Which of the following are the possible effects of this?

1 inability to carry out reflex actions below the neck
2 inability to perceive sensory stimuli below the neck
3 inability to voluntarily move muscles below the neck

A 1 only
B 1 and 2 only
C 2 and 3 only
D 1, 2 and 3

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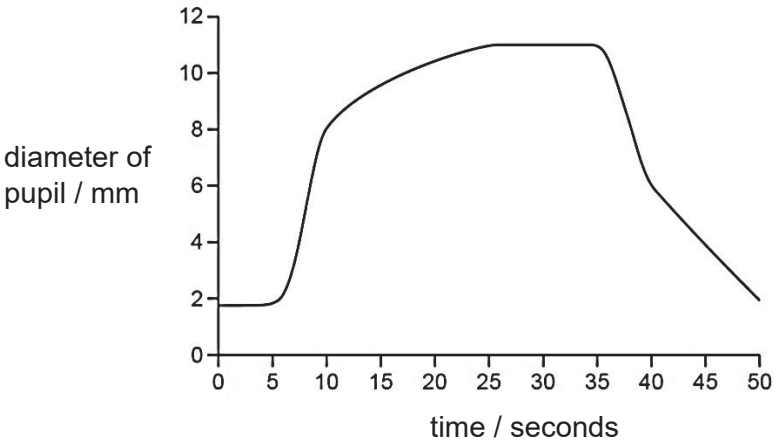
23 Which of the following diagrams, **A**, **B**, **C** or **D**, shows the correct sequence of neurons in a reflex arc?



24 Which structures cover the pupil at the front of a human eye?

A conjunctiva and sclera
B cornea and conjunctiva
C cornea and retina
D retina and sclera

25 The graph shows the changes in the size of the pupil of the eye as the light intensity of the surroundings is changed.



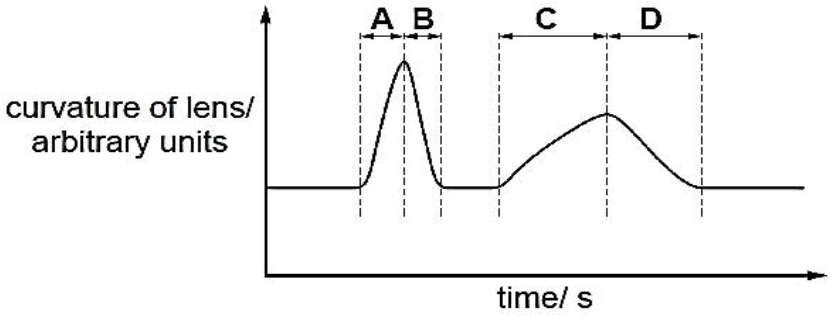
Between which times is the light intensity increasing?

A 5 to 10 seconds
B 10 to 25 seconds
C 25 to 35 seconds
D 35 to 40 seconds

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26 The diagram shows the curvature of the lens in a person's eye. The shape of the lens changes as the person watches two motorbikes go past at different speeds.

During which period was a motorbike moving towards the person at the higher speed?



27 Glycogen can undergo the following chemical change:

glycogen → glucose

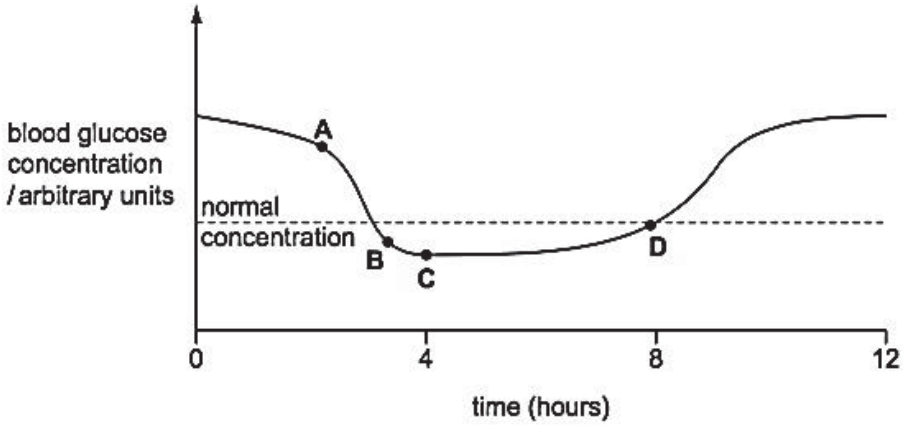
Which hormone(s) can be responsible for this chemical change?

	adrenaline	glucagon	insulin
A	√	x	√
B	√	√	x
C	x	√	x
D	x	x	√

Key:
√ = responsible
x = not responsible

28 A person with diabetes mellitus is receiving treatment with insulin injections. The graph shows how this person's blood glucose concentration changed during part of one day.

At which point was an insulin injection given?

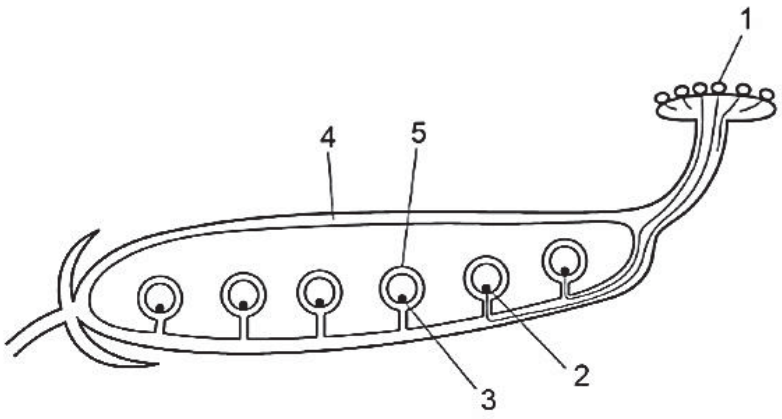


29 Which of the following occurs in meiosis but **not** in mitosis?

A Chromatids of chromosomes cross and twist around each other.
B Chromosomes line up independently along the equator.
C Sister chromatids are held together at the centromere.
D Sister chromatids separate during anaphase.

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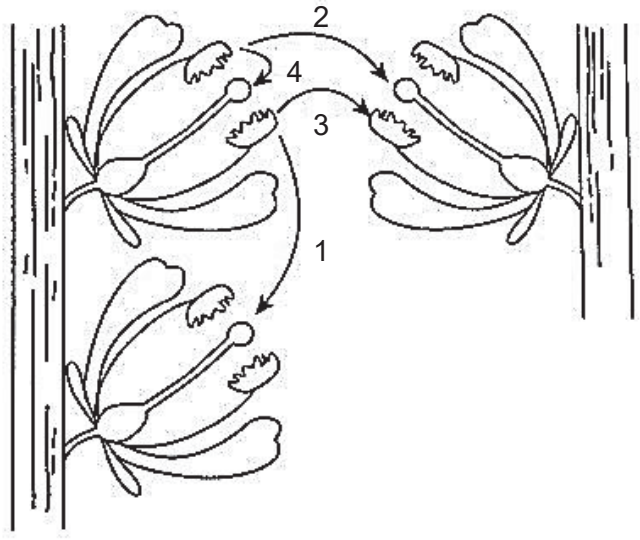
30 The diagram shows part of a flower after it has been pollinated.



Which labelled structures are diploid and which are haploid?

	diploid	haploid
A	1	4
B	2	1
C	3	2
D	4	5

31 The diagram below shows two plants of the same species.



plant 1 plant 2

Which arrow(s) indicate(s) a process that would lead to sexual reproduction?

A 2 only
B 2 and 3
C 1, 2 and 3
D 1, 2 and 4

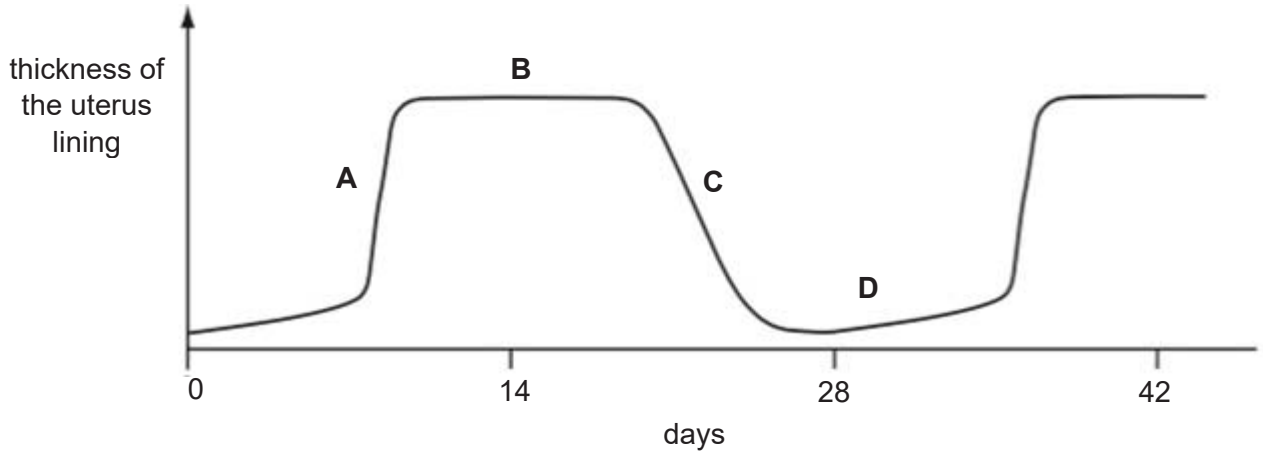
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32 Which one of the following statements correctly describes the sequence of events that follows after the pollen grain lands on the stigma?

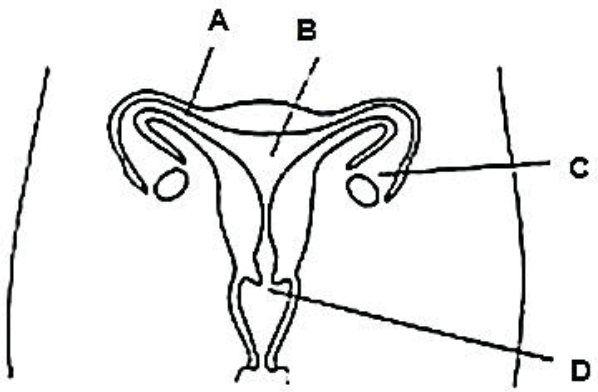
A The pollen grain forms a pollen tube which grows down the style to the ovule carrying the male gamete, which then fuses with the female gamete.
B The pollen grain passes down the style and fuses with the female gamete in the ovule.
C The pollen grain releases male gametes which digest their way through the stigma and style and then fuse with the female gametes in the ovule.
D The pollen grain releases male gametes which swim towards the ovule in the ovary, then fuse with the female gametes.

33 The diagram shows the changes in the thickness of the uterus lining of a woman during her menstrual cycle.

At which period of time is the woman most likely to be fertile?



34 You are a doctor treating a childless couple. Upon detailed study, you discover that the sperms from the husband are not strong enough to swim to meet the egg. As such, you decide to fertilise the egg in the laboratory and implant the embryo back into the wife. In the diagram, at which location would you place the embryo?



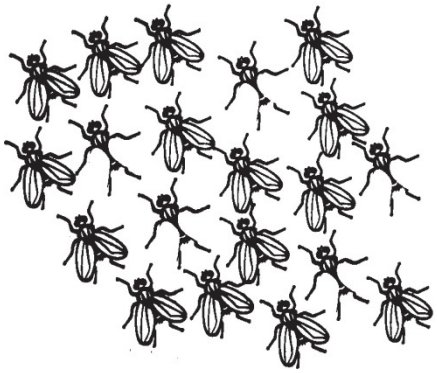
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35 Genetic cross of pure bred red four o'clock flowers with pure-bred white four o'clock flowers resulted in F1-hybrid offspring that all had pink flowers. When the F1 plants were self-pollinated, the resulting F2-generation plants had a phenotypic ratio of 1 red: 2 pink: 1 white.

The most likely explanation is …….

A pink flowers are the result of a blending of the red and white genotypes.
B flower colour is due to two or more complementary genes.
C heterozygous plants have a different phenotype from the pure bred parents because of codominance of the dominant allele.
D flower colour inheritance in four o'clock flower does not obey Mendelian laws.

36 The drawing shows fruit flies produced in a genetic experiment. The number of each type represents the ratio resulting from crossing two types of flies.



Assume that F represents the dominant allele and f represents the recessive allele involved in the cross.

Which of the following crosses would produce this ratio?

A FF x FF
B FF x ff
C Ff x Ff
D Ff x ff

37 A person with Down's syndrome is born with 47 chromosomes in each cell, instead of 46.

What could cause this?

A More than one sperm fused with the egg at fertilisation.
B Mutation happened during the production of the egg cell.
C Radiation caused a change in structure of a gene in the father's sperm.
D The mother was exposed to harmful chemicals while she was pregnant.

38 How many adenine molecules are present in a DNA molecule of 4000 bases, if 20% of the base molecules are cytosine?

A 600
B 800
C 1200
D 2400

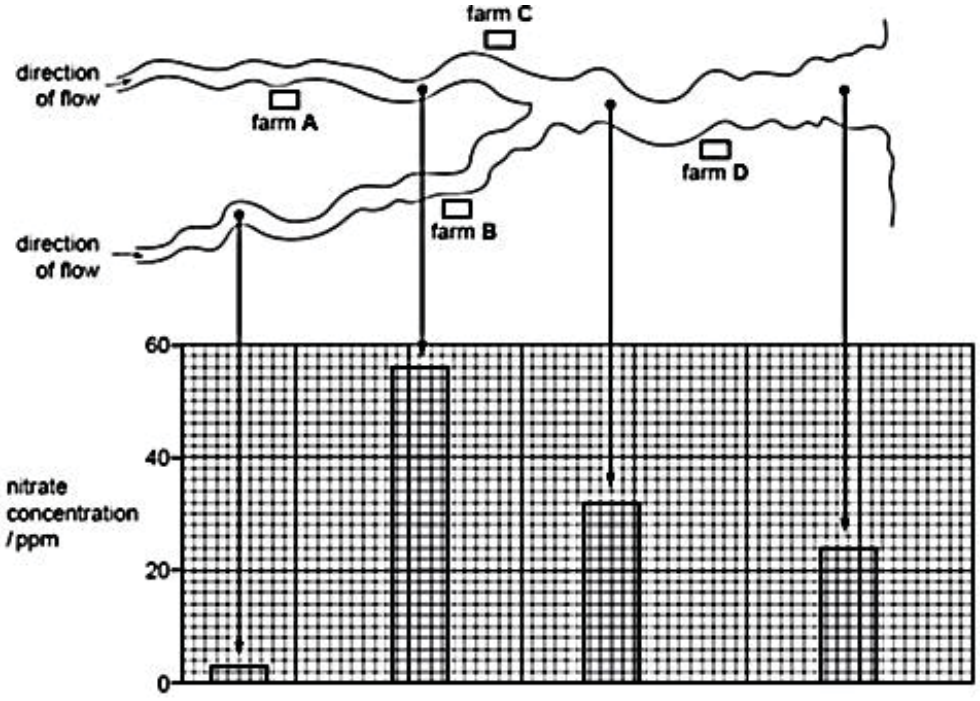
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39 Which of the following statements correctly describes an advantage that genetic engineering has over artificial selection?

A It is a quicker process, as only one species is required for beneficial traits to be passed down to offspring.
B It always creates organisms that are more suited to their natural environment.
C Genetically modified food is always more nutritious and safe for all consumers.
D There is a higher chance of offspring receiving the beneficial trait from the genetically engineered parent compared to using artificial selection.

40 The diagram shows the positions of four farms and the concentrations of nitrate at different points in a river.

Which farm is likely to have been using too much fertiliser on its land?



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West Spring Secondary School

PRELIMINARY EXAMINATION 2018

Biology **6093/02**

SECONDARY 4 EXPRESS

Name _____ ( ) **Date** 13 Sep 2018

Class _____ **Duration** 1 h 45 min

READ THESE INSTRUCTIONS FIRST

Write your name, class and register number on the cover page.
Write in dark blue or black pen on both sides of the paper.
You may use a soft pencil for any diagrams, graphs, tables or rough working.
Do not use staples, paper clips, highlighters, glue or correction fluid.

Section A (50 Marks)
Answer **all** questions.
Write your answers in the spaces provided on the Question Paper.
Show **all** relevant working.

Section B (30 Marks)
Answer all the questions.
Write your answers in the spaces provided on the Question Paper.

Electronic calculators may be used

Information for Candidates
You are advised to spend no longer than one hour on Section A and no longer than 45 minutes on Section B.
The number of marks is given in [ ] at the end of each question or part question.

FOR EXAMINER'S USE	
Section A	/50
Section B	/30
Total	/80

This document consists of **18** printed pages including the cover page.

Setter(s) Mdm Ho Soo Yin **[Turn over]**

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Section A

Answer **all** questions.

Write your answer in the spaces provided.

1 Fig. 1.1 shows a food web in an ecosystem.

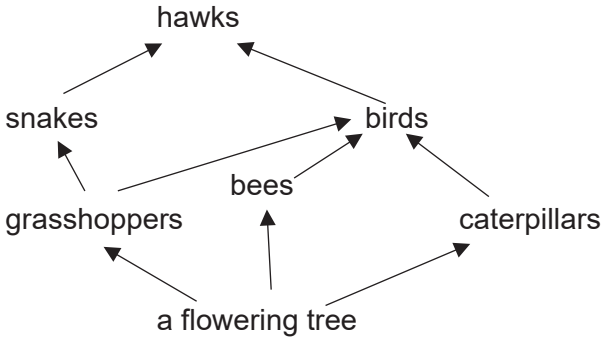


Fig. 1.1

(a) Draw a pyramid of numbers for a food chain involving caterpillars.

[1]

(b) It is known that consumers at the highest trophic level receive the highest amount of insecticides. Based on the pyramid of numbers you have drawn in **(a)**, explain why this is so.

.....

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.....

.....[3]

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(c) Explain the observations of the following populations when snakes are removed from this food web.

(i) The grasshopper population increases initially but decreases afterwards.

.....

.....

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.....

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..... [3]

(ii) The caterpillar population was constant for a while but decreases afterwards.

.....

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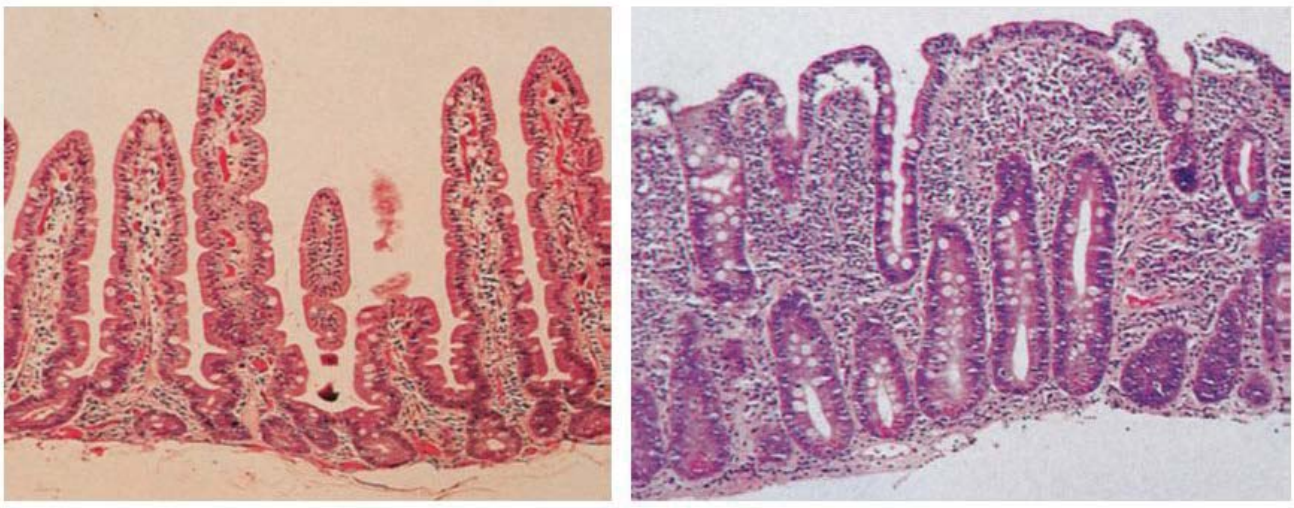
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..... [2]

[Total: 9]

2 A surgeon carried out a biopsy on a child who was not gaining the weight expected for his age. A small sample of tissue was removed from inside the child's small intestine.

Fig. 2.1 shows the appearance of the villi in a normal healthy child and that of the child patient's small intestine of the same age. Both diagrams are to the same scale.



healthy child child patient

Fig. 2.1

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(a) With reference to Fig. 2.1, state one difference between the villi of the healthy child and that of the patient.

.....

.....[1]

(b) Describe and explain three **other** features of a healthy small intestine that help to maximise the absorption of digested food.

.....

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.....[3]

(c) The child was diagnosed as suffering from coeliac disease. This is a condition in which an individual lacks a particular enzyme needed to digest gluten. Gluten is a protein found in wheat. A dietician was asked to advise the family on a suitable diet for the child. The child's parents found it hard to understand why the child could digest proteins present in meat but was unable to digest gluten. How might the dietician have explained to them, using his knowledge of enzymes?

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.....[3]

[Total: 7]

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3 Fig. 3.1 shows the structure of a male flower of a maize plant.

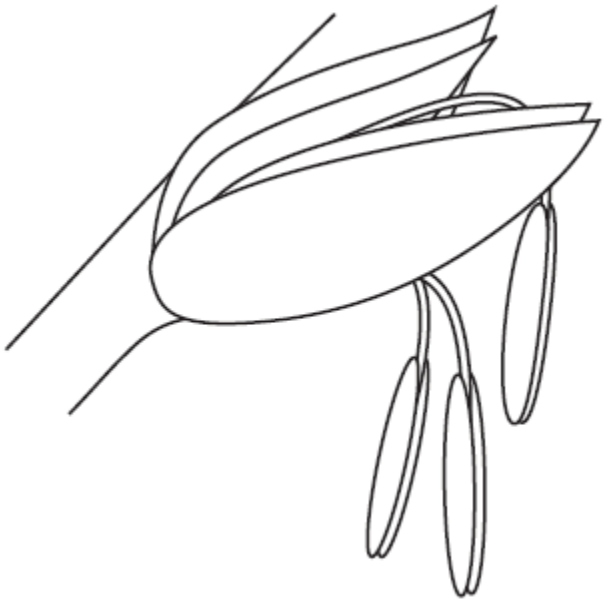


Fig. 3.1

(a) With reference to Fig. 3.1, explain how two features of this flower adapt it for wind pollination.

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.....[2]

(b) The corn borer is an insect pest of maize. The larvae feed on the leaves of the maize plants. The adults can fly but do not feed on maize plants.

Much of the maize that is grown in the USA has been genetically modified to produce Bt toxin, which is lethal to insects that feed on the leaves. However, many populations of the corn borer have now evolved resistance to the Bt toxin.

Explain how this resistance could have evolved.

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(c) The recessive allele, r, of the gene in corn borers confers resistance to Bt toxin. Larvae that are homozygous for the normal, dominant allele R, or that are heterozygous, are killed when they on Bt maize.

State the genotype of the corn borers that successfully turn from larvae into adults in the fields where Bt maize is grown.

.....[1]

(d) In order to reduce the number of corn borers resistance Bt toxin, farmers in the USA are required to grow up to 50% of their maize as non-Bt varieties. The non-Bt maize is grown in separate areas close to the fields of Bt maize. This is called the High Dose Refuge (HDR) strategy.

Almost all corn borer larvae feeding on this non-Bt maize have the genotypes RR or Rr. The HDR strategy assumes that, when these become adults, they will interbreed with the adults developing in the Bt maize fields.

Explain how the HDR strategy could reduce the proportion of corn borers that are resistance to the Bt toxin.

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.....[2]

[Total: 8]

4 Fig. 4.1 shows a kidney nephron and its blood supply.

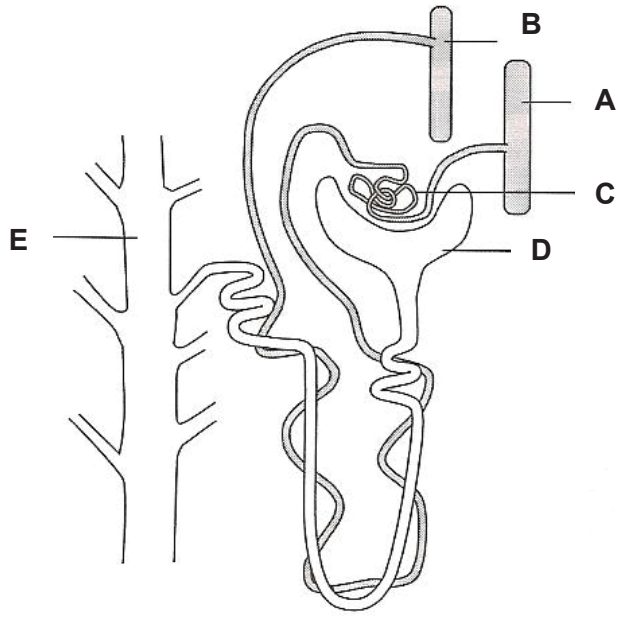


Fig. 4.1

(a) Name the parts labelled **A** and **C**.

A: .....

C: .....[2]

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(b) Table 4.1 shows the composition of samples obtained from **C** and **E**.

Table 4.1

substance	composition in **C** / g/cm^3	composition in **E** / g/cm^3
water	91	9.4
urea	0.02	2.4
glucose	0.1	0.0
protein	7.5	0.0
salts	0.5	1.1
creatinine	0.002	0.13

Some materials from **C** were not found in **E**. Explain what has happened to these materials.

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.....[4]

[Total: 6]

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5 Fig. 5.1 shows a section of lung tissue from a smoker.

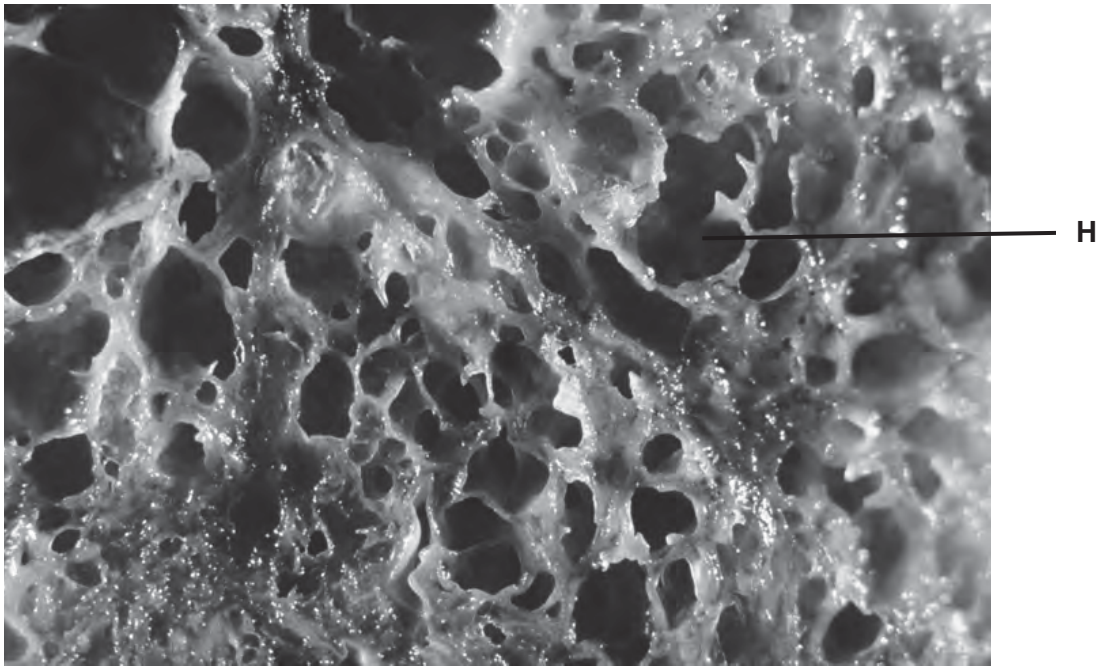


Fig. 5.1

In a smoker, the walls between the gas exchange structures in the lungs can break down, resulting in the damaged features visible in Fig. 5.1. One of these damaged features is labelled **H**.

(a) (i) Name the gas exchange structures which are damaged in Fig. 5.1.

.....

..... [1]

(ii) Name the smoking-related disease resulting in the damaged feature labelled **H** in Fig. 5.1.

.....

..... [1]

(b) Smoking-related diseases may increase the risk of respiratory diseases of the gas exchange system. Describe **and** explain how smoking can increase the risk of these diseases.

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.....[3]

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(c) From one cigarette, a smoker will inhale between 14 and 20 mg of carbon monoxide.

Describe the effects of carbon monoxide on haemoglobin.

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.....[2]

[Total : 7]

6 Fig. 6.1 shows a graph of the number of people, worldwide, estimated to be newly infected with the human immunodeficiency virus (HIV) in the years 1990 to 2008.

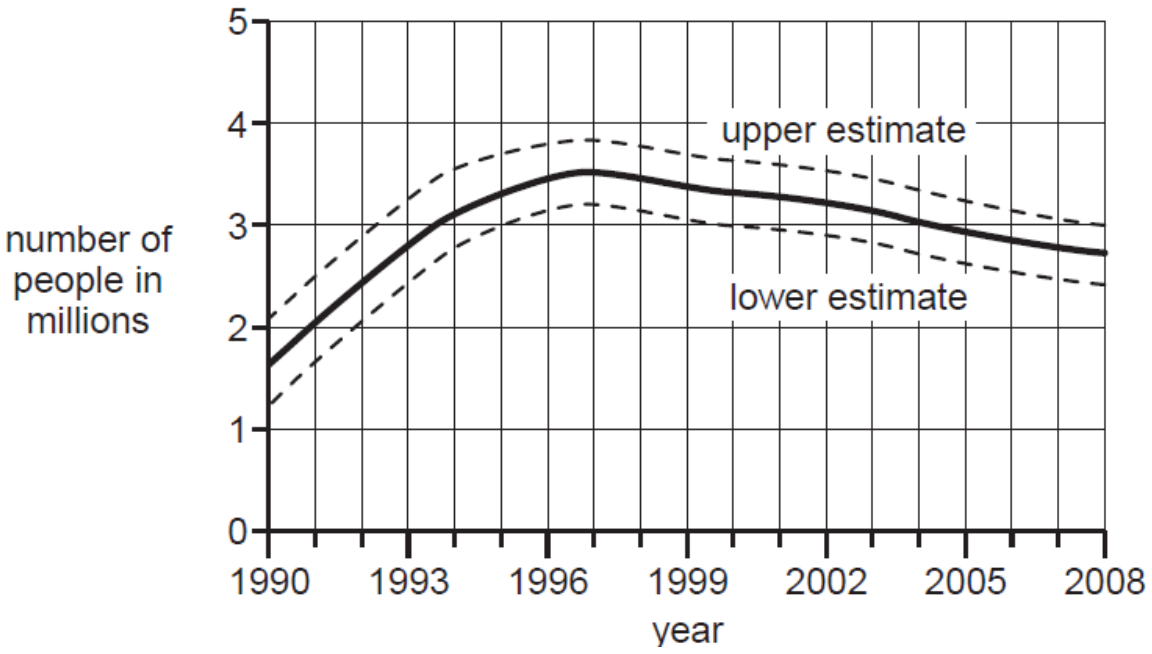


Fig. 6.1

(a) Use the information in Fig. 6.1 to describe the changes in the number of people newly infected with HIV.

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.....[3]

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(b) Suggest the possible explanations for the decrease in the number of people newly infected with HIV.

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.....[2]

[Total: 5]

7 Fig. 7.1 shows the stages in the process of genetic engineering to produce the hormone insulin.

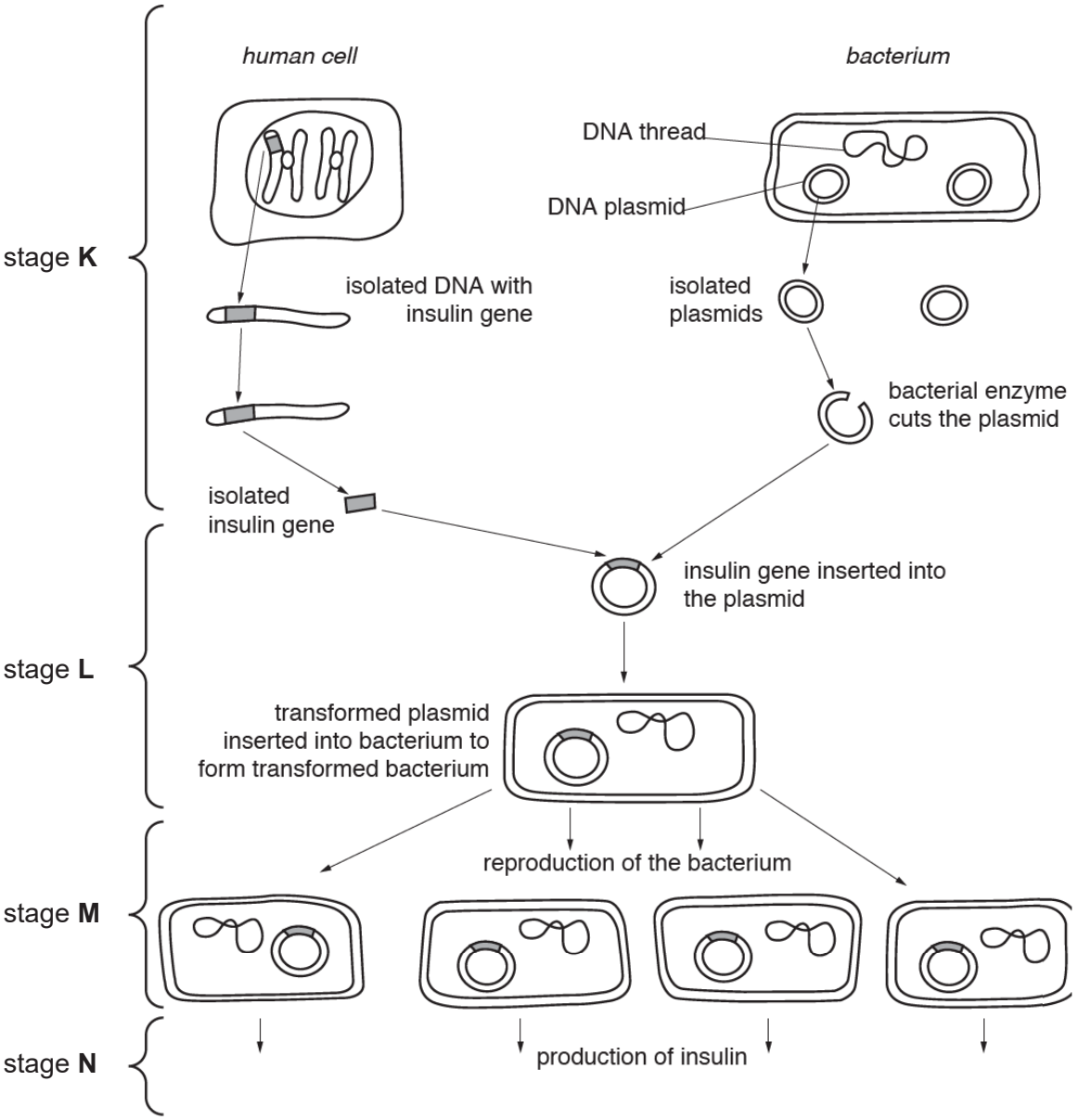


Fig. 7.1

Downloaded from SingaKids.com

(a) State the type of reproduction that takes place in stage **M** of Fig. 7.1. Use your knowledge of the process of cell division to explain why it is important that this type of reproduction occurs.

type of reproduction .....

explanation.....

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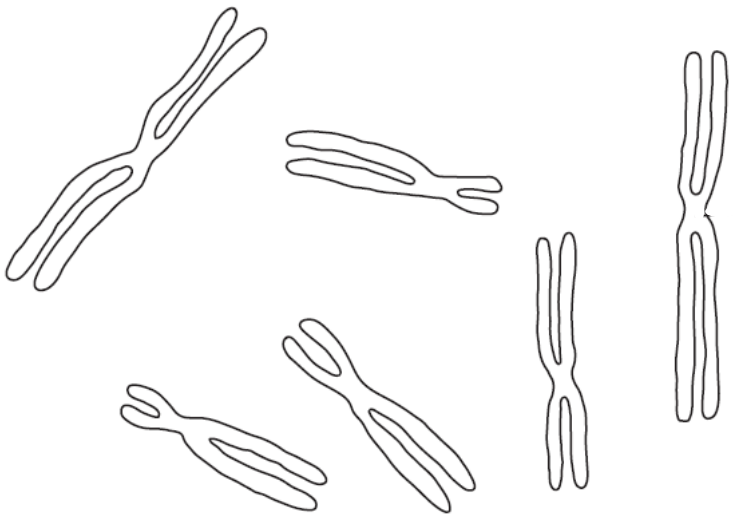
.....

.....[3]

(b) Name the condition in humans that is treated using insulin produced by the bacteria in stage **N** of Fig. 7.1.

.....[1]

(c) Fig. 7.2 shows the chromosomes in a skin cell of a small deer found in North America at prophase of mitosis.



(i) State the diploid chromosome number of the deer.

.....[1]

(ii) On Fig. 7.2, shade a pair of homologous chromosomes. [1]

(iii) During the formation of eggs in the ovary of the female deer, the chromosome number changes. State what happens to the chromosome number and explain why this change is necessary.

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.....[2]

[Total: 8]

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Section B

Answer **three** questions.

Question **10** is in the form of an **Either/Or** question. Only one part should be answered.

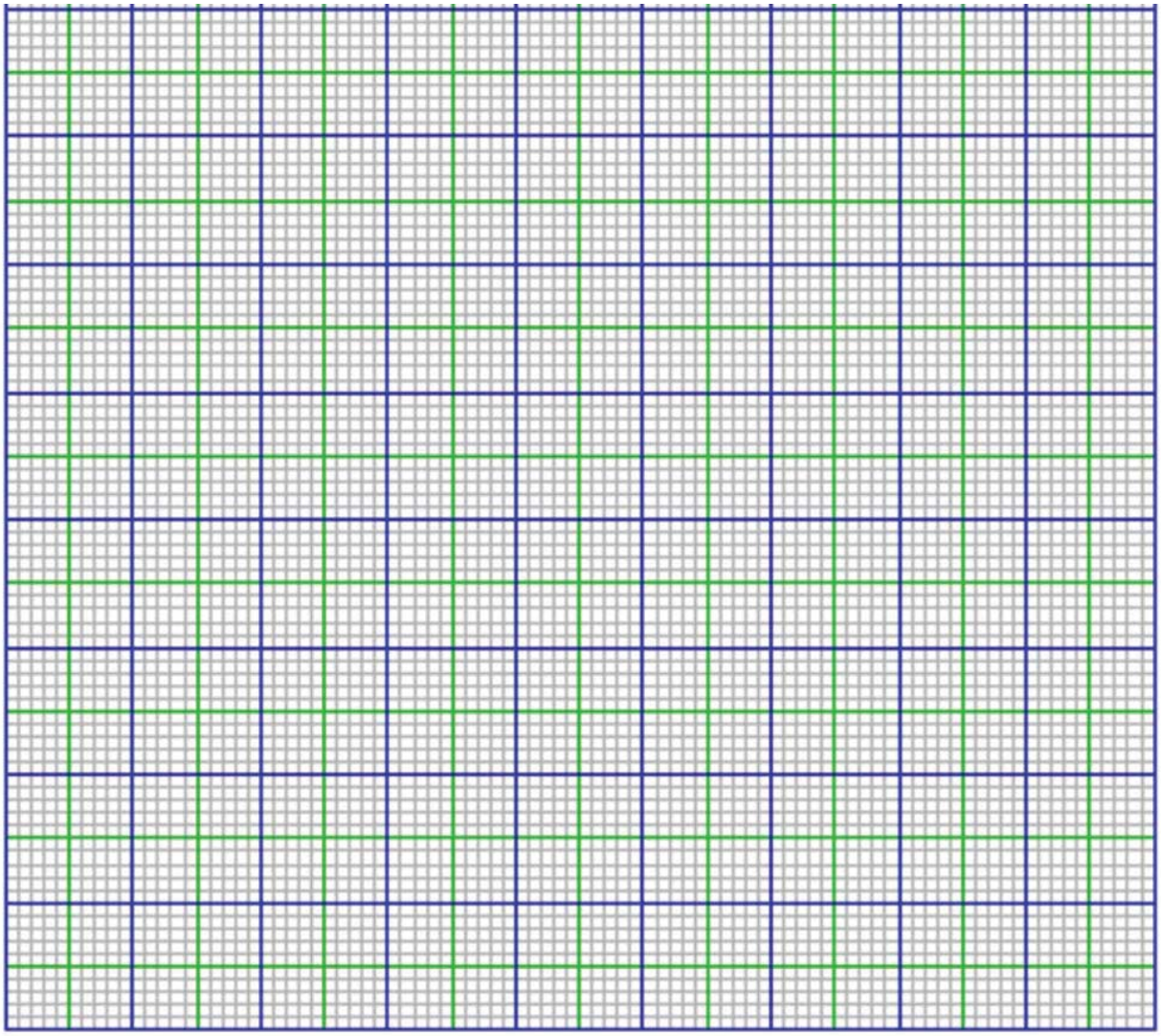
8 Table 8.1 shows the rate of photosynthesis of two different plants over a range of light intensities.

Table 8.1

light intensity / lux	rate of photosynthesis / mg carbohydrate produced per unit area per min	
	plant **R**	plant **S**
5	2	3
10	5	10
20	9	29
30	19	46
40	23	49
50	32	54
60	42	58
70	55	60
80	72	60
90	72	60

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(a) Plot the data for all the light intensities in the range of 5 to 90 lux on the grid.



[3]

(b) State, with a reason, which plant would grow best in shady conditions.

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.....[2]

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(c) Explain why, at light intensity above 80 lux, the rate of photosynthesis in both plants might increase if they were:

(i) supplied with higher concentrations of carbon dioxide;

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..... [2]

(ii) exposed to 40 °C.

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(d) Suggest why the rate of photosynthesis may fall when a plant wilts.

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..... [2]

[Total: 11]

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9 Fig. 9.1 shows a longitudinal section of the heart of man.

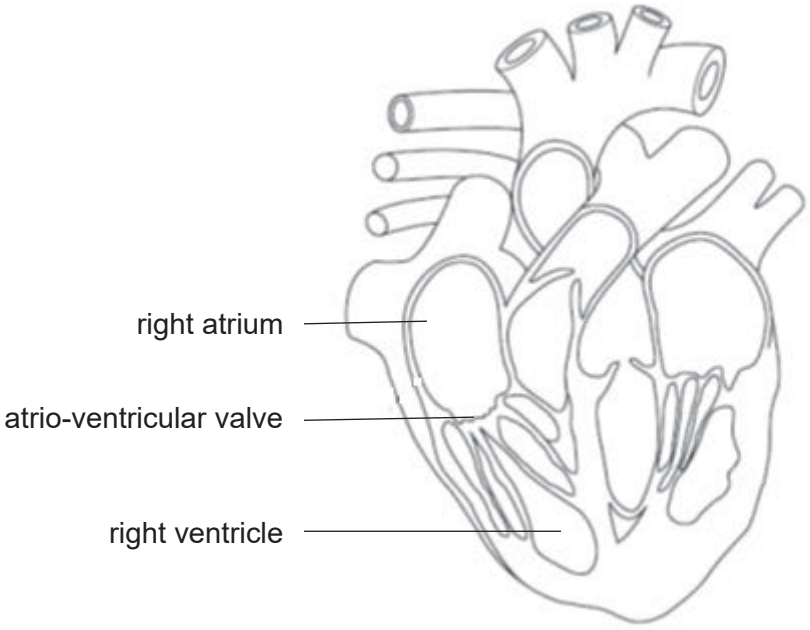


Fig. 9.1

(a) Explain the difference in the thickness of the left ventricle and the right ventricle.

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.....[3]

(b) Explain how the structures labelled in Fig. 9.1 ensure that blood flows in the correct direction.

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.....[3]

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(c) Outline the effects of atherosclerosis in coronary arteries and the resulting effects on the heart itself.

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.....[3]

[Total: 9]

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10 either

(a) Describe and explain the events that occur after the body temperature falls, which will allow the body temperature to return to its normal level.

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(b) Explain what is meant by control by 'negative feedback'.

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[Total: 10]

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10 or

Carbon flows through the ecosystem in the carbon cycle whereas energy flows in a non-cyclical manner.

(a) Explain how carbon, in the form of organic matter in the producer, flows through the ecosystem.

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.....[7]

(b) Explain why energy has to be constantly supplied to the ecosystem.

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.....[3]

[Total: 10]

~ END OF PAPER ~

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Biology Prelim 2018 Paper 1 Answer Scheme

1	2	3	4	5	6	7	8	9	10
B	C	B	A	C	D	D	B	D	C
11	12	13	14	15	16	17	18	19	20
C	D	D	B	B	C	A	C	A	B
21	22	23	24	25	26	27	28	29	30
D	C	A	B	D	A	B	A	A	B
31	32	33	34	35	36	37	38	39	40
D	A	B	B	C	C	B	C	D	A

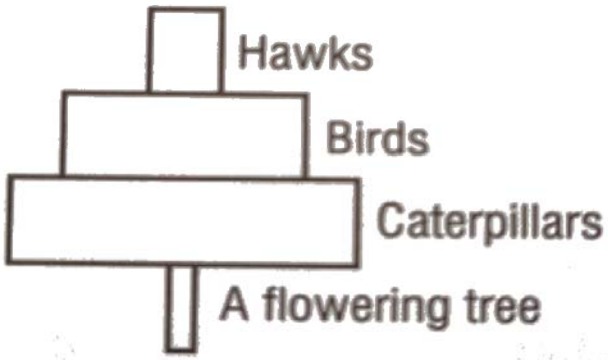
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SECONDARY 4 EXPRESS BIOLOGY

PRELIMINARY EXAMINATION, 2018

SUGGESTED MARK SCHEME P2

Section A				
		Answers	**Marks**	**Remarks**
1	**(a)**		[1]	
	(b)	1. Leaves that contain insecticides are eaten by the caterpillars. As these insecticides are not <u>biodegrable/are not broken down</u>, they accumulate in the bodies of caterpillars./ bioaccumulation ; 2. As birds feed on the caterpillars and hawks feed on these birds, the concentration of insecticides increases along the food chain. ; 3. Highest concentration of insecticides will be found <u>in hawks</u>. ; 4. This is known as <u>bioamplication/bioaccumulation</u> ; **Reject: indigestible**	[1] [1] [1] [1]	Point 1 is a must Point 2, 3 and 4, any 2 Max 3 marks
	(c) (i)	1. Initially, the grasshopper population increases as there are less predators feeding on them and they can <u>reproduce</u> more. ; 2. However, their population decreases later dramatically due to the <u>competition for food</u>. ; 3. The flowering plant is the only producer of food in this food web/does not produce enough food for the growing population. ;	[1] [1] [1]	
	(c) (ii)	1. Initially, the caterpillar population remains constant because they belong to two different food chains / snakes do not prey on them./have not lost source of food or predator ; 2. However, both grasshoppers and caterpillars feed on the same food source (leaves of flowering plant), an increase in the population of grasshopper provides competition for food with the caterpillars. ; Or No snakes, grasshopper population increases, more food for birds, bird population increases, more caterpillars are eaten	[1] [1]	

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2	**(a)**	The healthy child has more villi /more protrusion patient has fewer villi / The healthy child's villi are longer / patient has shorter villi / Patient's villi are not properly formed/ Healthy child has villi separated/ Healthy child has larger surface area for villi;	[1]	Any 1 point **Reject: Villi has more folds,**
	(b)	1. Microvilli provide a larger surface area to volume ratio for food to be absorbed faster. ; 2. Each villus is supplied with a network of blood capillaries to maintain a steep diffusion gradient for rapid diffusion of food substances. ; 3. The villi are thin walled / one cell thick walls of villi provide a short diffusion distance for digested food to pass through the walls quickly. ; 4. The small intestine is long to allow more time for digested food to be absorbed ; 5. Mitochondria are found in the cells of the epithelium to help in the absorption via active transport.	[1] [1] [1] [1] [1]	Any 3 points
	(c)	1. Enzymes are specific in action / Each protein must be digested by one specific enzyme. ; 2. Each enzyme has an active site. 3. The shape of the active site is complementary to shape of substrate / only allows a particular substrate to fit in to form an **(enzyme-substrate complex) not necessary** ; 4. Hence, the enzyme which digests protein in the meat cannot digest protein in gluten. ;	[1] [1] [1] No mark	
3	**(a)**	1. Anthers, outside flower / exposed, to allow wind to carry pollen away / 2. Long / flexible filaments/pendulous stamens, to allow wind to dislodge the pollens / 3. No / small petals, to allow anthers to be exposed to the wind / less energy is channelled to produce large petals and more energy channelled to make pollens instead 4. Anthers large to produce large quantities of pollen	[1] [1]	Any 2 points
	(b)	1. (Genetic) mutation occurs in the corn borer ; (there are variation in some corn borers) 2. Mutated Corn borers more likely to survive / have selective advantage ; 3. These corn borers grow into adults and are likely to breed / reproduce ; 4. Hence, the mutated gene / resistance alleles are passed on to the next generation ; 5. This leads to increase in frequency of allele for resistance ;	[1] [1] [1]	Any 3 points
	(c)	rr	[1]	
	(d)	1. When non-resistant borers from outside breed with resistant borers, many offspring will not be resistant ; 2. Because many of the offspring will be Rr / heterozygous/less will be rr ; 3. Detail e.g. results of rr / RR **and** rr x Rr	[1] [1]	Max 2 points

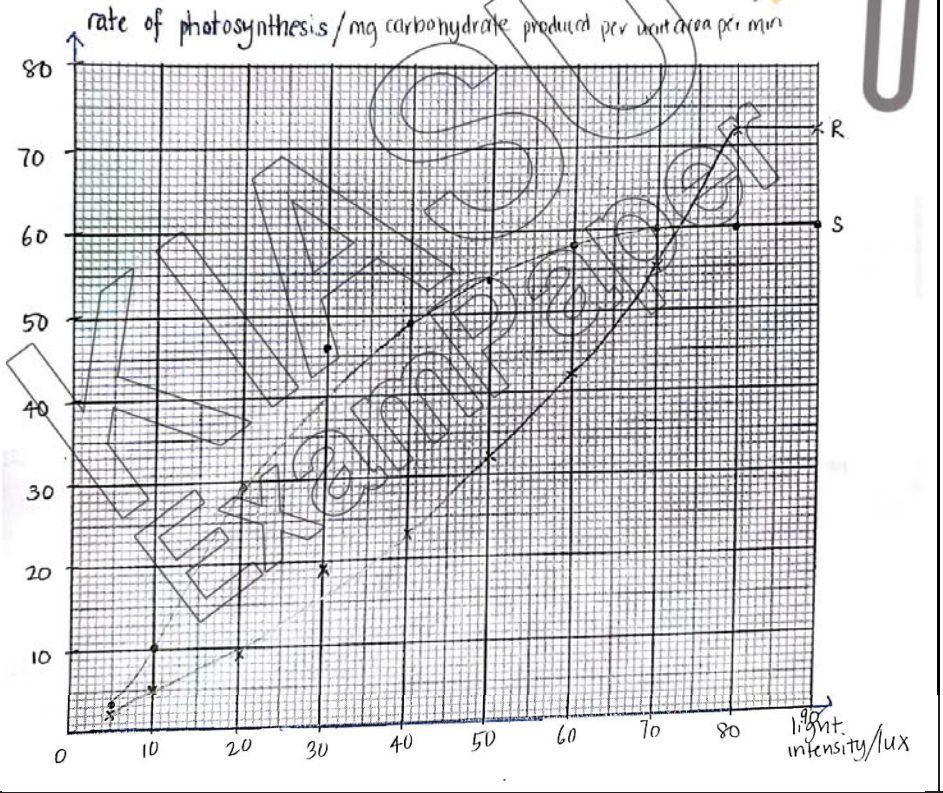
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4	**(a)**	**A**: renal artery **C**: glomerulus (A:blood capillaries) **Accept: similar spelling**	[1], [1]	
	(b)	1. During ultrafiltration at the glomerulus, small molecules are filtered out into the proximal convoluted tubule ; 2. Glucose molecules are small enough to move into/ pass into the Bowman's capsule. ; 3. However, glucose molecules are useful and all are selectively reabsorbed into the blood capillaries. ; 4. Proteins are too large to enter the Bowman's capsule therefore remain in the bloodstream ;	[1] [1] [1] [1]	
5	**(a) (i)**	Alveoli / air sacs ; **Reject: alveolar wall**	[1]	
	(ii)	emphysema ;	[1]	
	(b)	1. Tar and irritants present in the cigarette smoke paralyses cilia lining the air passages ; 2. Dust particles trapped in the mucus lining the air passages cannot be removed ; 3. Increasing the risk of chronic bronchitis and emphysema ; 4. Tar causes lung cancer ;	[1] [1] [1] [1]	Any 2 from point 1, 2 or 3 if point 4 is given as one of the answer
	(c)	1. Carbon monoxide combines with haemoglobin to form (**carboxyhaemoglobin**) **– no need write this** ; 2. Hence it reduces the ability of haemoglobin to carry oxygen to the rest of the body cells / decreases oxygen level in the blood;	[1] [1]	
6	**(a)**	1. number of infected people increases steeply from 1990 until 1996 / 1997 ; 2. peaks at 3.5 million / any figure between 3 to 4 million ; 3. decrease from 1996 / 1997 ; 4. number of new cases in 2008 is greater than in 1990 ;	[1] [1] [1] [1]	Any 3 points With at least 1 mention of the data
	(b)	1. reduce risk of infection by using condoms / protection during sexual intercourse ; 2. abstinence ; 3. not sharing needles / using sterile needles ; 4. treat blood (products) / testing potential blood donors or donated blood ; 5. increase accuracy in contact tracing ; 6. increased awareness of precautions / risks / transmission ; 7. increased use of antiviral drugs to reduce transmission ; 8. some strains are less infective than others ; 9. less reporting of new cases ;	[1] [1]	Any 2 points

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7	**(a)**	asexual reproduction 1. Asexual reproduction results in the production of genetically identical offspring. ; 2. Since the transgenic bacterium already contains the insulin gene, by reproducing asexually, many identical copies of this bacteria are produced and hence more insulin gene can be produced. ;	[1] [1] [1]	
	(b)	Diabetes mellitus	[1]	
	(c)(i)	6	[1]	
	(c)(ii)	Shade any 2 chromosomes of the same size	[1]	
	(c)(iii)	The chromosome number became half / 3/ chromosome numbers become haploid ; So that when the nucleus of the female gamete fuse with the nucleus of the male gamete, diploid number of chromosomes in the zygote / species is restored.	[1] [1]	
Section B				
8	**(a)**		[1] [1] [1]	Axis correct Points Correct best fit graphs drawn
	(b)	Plant S ; At low light intensity (0 to 40 lux), the rate of photosynthesis increases at much faster rate compared to plant R. ; Or Plant 2 is able to produce 29 mg of carbohydrate at 20 lux but plant R needs more than 40 lux of light **(accept this type of answer as above)**	[1] [1]	

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	(c) (i)	1. Since above 80 lux, the rate of photosynthesis is constant for both plants, light intensity is no longer the limiting factor ; 2. Since carbon dioxide is essential for photosynthesis to take place/it might be a limiting factor, the rate of photosynthesis might increase when its concentration is increased ;	[1] [1]	
	(c) (ii)	1. Photosynthesis is an enzyme dependent process ; 2. Increasing the temperature to 40 °C might increase the enzyme activity which will in turn increase the rate of photosynthesis ;	[1] [1]	
		3.		
	(d)	Wilting is caused when leaf cells lose their turgidity / became flaccid 1. Stomata closes, carbon dioxide diffusion into cells may decrease ; 2. leaf folds up, reducing exposed surface, light energy absorbed may reduce; 3. Less water for photosynthesis; Rate of photosynthesis falls	 [1] [1] [1]	Ignore first sentence Any 2 points
9	**(a)**	1. Left ventricle has thicker / more muscle than the right ventricle ; 2. Left ventricle pumps blood to the rest of the body / systemic circulation which is a longer distance / further away / at higher pressure ; 3. Right ventricle only pumps blood to the lungs which is a short distance from the heart ;	[1] [1] [1]	Reject : ventricle wall needs to withstand high pressure
	(b)	1. When pressure in right atrium is greater / higher than pressure in the ventricles, the valves open to allow blood to flow from right atrium into right ventricle ; 2. When the right ventricle contracts, the pressure in right ventricle is greater than pressure in right atrium, causing the valves to close ; 3. Hence, the blood can only flow in one direction which is to the pulmonary arteries ;	[1] [1] [1]	
	(c)	1. fat / cholesterol / deposited in, plaque formed in wall of artery narrows lumen of artery ; 2. blood flow reduced / restricted (in coronary arteries) and less oxygen / glucose, supplied to heart muscle for aerobic respiration **(to release energy)-not necessary** ; 3. heart attack / heart failure / cells in heart might die ;	[1] [1] [1]	Reject: no oxygen flows to heart muscles

10	**Either**			
	(a)	When the body temperature drops, 1. it stimulates temperature receptors in our skin, which send	 [1]	 Point 1 is a

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		nerve impulses to the hypothalamus. The hypothalamus will send nerves impulses to the relevant body parts to bring about the following changes: 2. less active sweat glands/sweating stops (**Accept**: inactive) 3. less evaporation of water in sweat and less heat of vaporisation is lost from the body (**Reject**: no evaporation) 4. Vasoconstriction of arterioles/ blood vessels (**Reject**: capillaries/veins) 5. Results in less blood to capillaries and less heat is lost by convection, radiation and conduction 6. Increase in metabolic rate to increase the amount of heat released within the body 7. Shivering might occur which generates heat 8. Hair erector muscles contract, causing the hairs to stand. This helps to trap a layer of air which can reduce heat loss as air is an insulator of heat	[1] [1] [1] [1] [1] [1] [1]	must Point 2 to 8, any 6 points
	(b)	Negative feedback is 1. A change in level / of set point/ in norm triggers /causes / a response / reaction / sequence of events ; 2. Which leads to restoration to original level ; 3. An example is when water potential in the body increases above norm, it is detected by the receptor in the body. The body will respond and returns the water potential to the norm. ; Or point 3, students can give any other relevant examples (temperature regulation, glucose regulation)	[1] [1] [1]	
10	**Or**			
	(a)	1. Plants contain carbon in the form of organic matter such as starch / protein/fat/cellulose. ; 2. Glucose in the plant is used during respiration, releasing carbon dioxide into the atmosphere. ; 3. Animal feed on plant and carbon is incorporated into body tissues (fats, proteins, glycogen) ; 4. Glucose in the animal is used during respiration to release carbon dioxide into the atmosphere. ; 5. Death of animal / plant result in decomposition ; 6. Respiration by decomposers release carbon dioxide into the atmosphere ; 7. Combustion of fossil fuels release carbon dioxide into the atmosphere ; 8. Photosynthesis by green plants remove carbon dioxide from the atmosphere to form glucose / organic matter again ;	[1] [1] [1] [1] [1] [1] [1]	Any 7 points
	(b)	1. Respiration of living organisms, <u>energy is lost as heat</u> to the environment ; 2. Egested/excreted materials/dead organisms/uneaten body parts contain trapped chemical energy ; 3. Living organisms cannot use heat energy to do work / cannot be recycled ;	[1] [1] [1]	

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